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## NEW DATA OF THE GENUS *MEDIORHYNCHUS* (*ACANTHOCEPHALA*, *ARCHIACATHOCEPHALA*, *GIGANTORHYNCHIDAE*) FROM BULGARIAN BIRDS

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**New Data of the Genus *Mediorhynchus* (*Acanthocephala*, *Archiacathocephala*, *Gigantorhynchidae*) from Bulgarian Birds.** Dimitrova Z. M. — The investigations on a new faunistic material of avian acanthocephalans collected during the period 1984–1995 from Bulgaria revealed the presence of 4 species of the genus *Mediorhynchus*: *M. papillosus* from *Motacilla flava*, *Ficedula parva* (new host record) and *Hirundo rustica*; *M. micracanthus* from *Perdix perdix*, *Picoides major*, *Hirundo rustica*, *Acrocephalus arundinaceus*, *Fringilla coelebs*, *Sturnus vulgaris*, *Corvus frugilegus* (new host record) and *Corvus corone*; *M. rodensis* from *Garrulus glandarius* and *M. tenuis* from *Perdix perdix*, *Glareola pratincola*, *Melanocorypha calandra* and *Alauda arvensis* (new host records). A new geographical record for Bulgaria is this of *M. rodensis*. Illustrated descriptions of the Bulgarian specimens are presented.

**Key words:** *Acanthocephala*, *Mediorhynchus*, birds, morphology, Bulgaria.

**Новые данные рода *Mediorhynchus* (*Acanthocephala*, *Archiacathocephala*, *Gigantorhynchidae*) от птиц Болгарии.** Димитрова З. М. — В ходе исследования нового фаунистического материала по акантоцефалам птиц, собранного в период 1984–1995 гг. в Болгарии, обнаружено 4 вида рода *Mediorhynchus*: *M. papillosus* от *Motacilla flava*, *Ficedula parva* (новый хозяин) и *Hirundo rustica*; *M. micracanthus* от *Perdix perdix*, *Picoides major*, *Hirundo rustica*, *Acrocephalus arundinaceus*, *Fringilla coelebs*, *Sturnus vulgaris*, *Corvus frugilegus* (новый хозяин) и *Corvus corone*; *M. rodensis* от *Garrulus glandarius* и *M. tenuis* от *Perdix perdix*, *Glareola pratincola*, *Melanocorypha calandra* и *Alauda arvensis* (новый хозяин). *M. rodensis* впервые найден в Болгарии. Приведены иллюстрированные описания экземпляров из Болгарии.

**Ключевые слова:** *Acanthocephala*, *Mediorhynchus*, птицы, морфология, Болгария.

Until now, the following species of the genus *Mediorhynchus* Van Cleave, 1916 have been reported from Bulgaria: *M. papillosus* Van Cleave, 1916 (see Stoimenov, 1962, 1963; Tsacheva, 1967; Tsacheva-Petrova, 1971; Dimitrova & Genov, 1992), *M. micracanthus* (Rudolphi, 1819) (see Pavlov, 1940, 1945; Zhelyazkova-Paspaleva, 1962; Tsacheva, 1965a, 1967; Paspalev et al., 1969; Tsacheva-Petrova, 1971; Petrova, 1974), *M. garruli* Yamaguti, 1939 (see Tsacheva, 1965b; Stoimenov et al., 1976), *M. tenuis* Meyer, 1931 (see Kamburov, 1966) and *M. zosteropis* (Porta, 1913) (see Tsacheva-Petrova, 1971). The studies cited have mainly faunistic character and only occasionally contain descriptions or illustrations in order to contribute to the knowledge on the infraspecific variability of these species.

In this report, on the basis of investigations on new specimens collected during the period 1984–1995 in Bulgaria, new data are presented for the species composition, distribution and morphology of acanthocephalans of the genus *Mediorhynchus*.

### Material and methods

The number of specimens, their hosts, localities and dates of collection are given in the section for each species. Voucher specimens are deposited in the Collection of the Parasitic Worms Division, The Natural History Museum, London (NHM).

Specimens were fixed and preserved in 70% ethanol. They were studied in temporary mounts cleared in glycerol (25–100%), lactophenol or dimethylphthalate. The descriptions are based on specimens from one locality and one host specimen. The measurements are in millimetres. Figures given in parentheses after the range are those of single measurements outside the normal range.

## CLASS ARCHIACANTHOCEPHALA MEYER, 1931

## Order GIGANTORHYNCHIDA Southwell &amp; Mac Fie, 1925

## Family Gigantorhynchidae Hamann, 1892

*Mediorhynchus papillosus* Van Cleave, 1916 (Figs. 1–3)

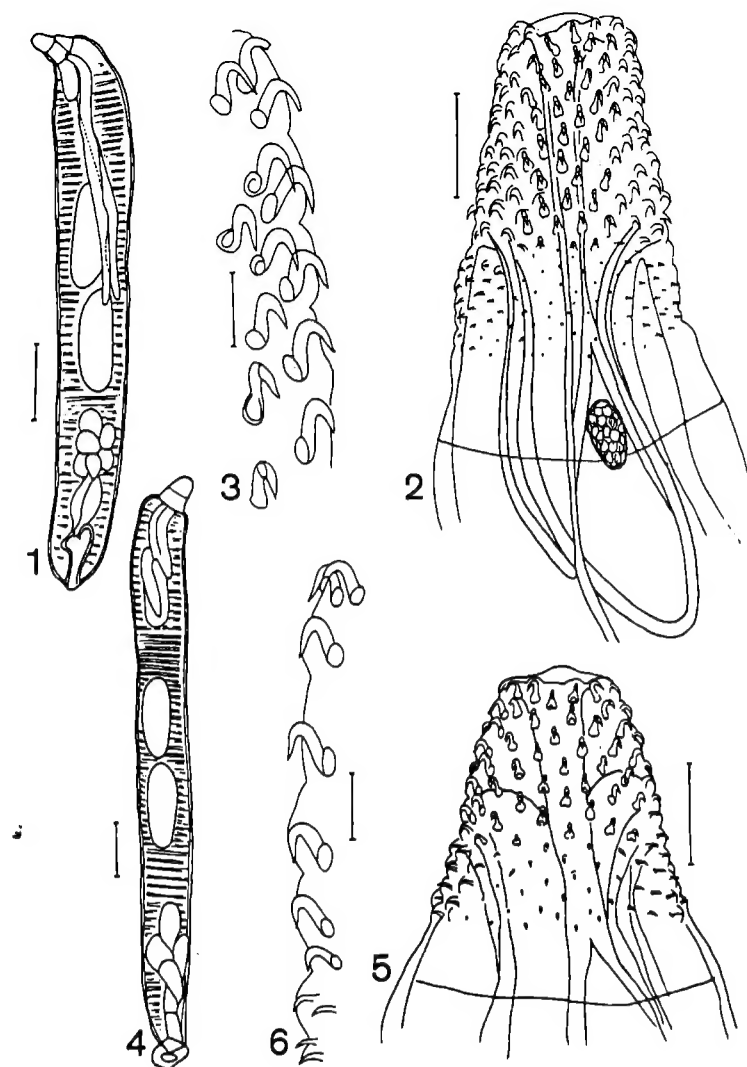
Material. 3 ♀ from *Ficedula parva* (Bechst.), Balchik, April 1984; ♀ from *Hirundo rustica* L., Krapec, April 1985; ♂ and ♀ from *Motacilla flava* (L.), Krapec, October 1985; ♀ from *M. flava*, Krapec, June 1988; 2 ♀ from *M. flava*, Krapec, May 1992; ♂ and 9 ♀ from *M. flava*, the village of Trankovo (Stara Zagora District), May 1989. Voucher specimens: NHM 1997.7. 3.1–6 (from *M. flava*, Trankovo); NHM 1997.7. 3.7–8 (from *M. flava*, Krapec).

Description (based on ♂ and 9 ♀ from *Motacilla flava*, Trankovo, May 1989). Trunk elongate, cylindrical, significantly longer in females. Main vessels of lacunar system with regular transverse anastomoses. Proboscis truncate, consisting of two parts separated by constriction: anterior and posterior (according to Schmidt, 1977, protoboscis and teloboscis, respectively). Protoboscis armed with hooks with well-developed roots. Teloboscis armed with rootless hooks transformed into spines. Roots of hooks with swellings at base. Neck with sensory pits. Nerve ganglion oval, 0.140–0.156 long, at about 0.75 from proboscis apex. Lemnisci long, slender, usually slightly subequal in length, with 7 giant nuclei in each.

Male. Total length 7.35. Trunk 6.78 long and 1.05 wide. Length of proboscis 0.456 (proboscis malformed): protoboscis 0.331 long, teloboscis 0.125 long. Proboscis 0.220 wide at constriction. Protoboscis with about 20 nearly longitudinal rows, 5–6 hooks in each row, or 9 spiral rows. Teloboscis with 32–34 nearly longitudinal rows, 3–4 spines in each row. Maximum length of hooks (first 1–3 hooks) (blade×root) 0.030–0.0325×0.0275–0.0350 (0.036×0.0375–0.040 in the specimen from Krapec). Maximum length of spines 0.0225–0.025. Neck 0.113 long and 0.469 wide. Proboscis receptacle 0.75 long and 0.20 wide. Lemnisci 3.3–3.4 long and 0.15 wide, reaching to posterior testis. Testes elongate, situated in tandem without touching one another, occupying approximately second third of trunk, 1.40–1.45 long and 0.42 wide. Cement glands 8 (?) in number, situated in complex. Length of complex 0.86, situated at 0.27 from end of posterior testis. Cement ducts 0.78 long. Genital bursa invaginated.

Female. Total length 13.40–19.00. Trunk 12.66–18.21 long, with maximum width 0.99–1.23 at anterior third of lemnisci. Total length of proboscis 0.544–0.660: protoboscis 0.388–0.440 long, teloboscis 0.106–0.230 long. Proboscis 0.325–0.394 wide at constriction. Protoboscis with 22–24 nearly longitudinal rows, 6 (7–5) hooks in each row, or 9–12 spiral rows, 9–10 (11) hooks in each row. Teloboscis with 35–44 nearly longitudinal rows of spines, 4–5 spines in each row, or 10–12 spiral rows, 7–10 spines in each row. Maximum length of hooks (blade×root) 0.030–0.0425 (0.044)×0.0375–0.0475 (0.050). Maximum length of spines 0.020–0.025. Neck 0.156–0.206 long and 0.531–0.619 wide. Proboscis receptacle 0.80–0.90 long. Lemnisci 3.6–4.5 long and 0.18–0.24 wide. Total length of female genital tract 0.75–0.80. Ligament sacs filled with eggs. Eggs oval, with thick outer shell, without polar prolongations. Dimensions of eggs 0.0450–0.0675×0.0325–0.040.

Remarks. The species was described by Van Cleave (1916) on the basis of specimens from *Myiochanes virens* (= *Contopus virens*) and *Porzana carolina* L. from North America. The initial description was followed by several redescrptions from various hosts and zoogeographical regions (Petrochenko, 1958; Khokhlova, 1966; Ivashkin & Shmytova, 1969; Schmidt & Kuntz, 1977; Peresadko, 1980; Dimitrova & Genov, 1992; Lisitsyna, 1994; Amin & Dailey, 1998). The new specimens from Bul-



Figs. 1-6. *Mediorhynchus* spp. 1-3. *M. papillosus* Van Cleave, 1916, specimens from *Motacilla flava*: 1-male, general view; 2-female, proboscis, its receptacle and the nerve ganglion; 3-male, nearly longitudinal rows of hooks, lateral view. 4-6. *M. micracanthus* (Rudolphi, 1819), specimen from *Hirundo rustica*: 4-male, general view; 5-male, proboscis; 6-male, nearly longitudinal row of hooks, lateral view. Scale bars = 1.0 mm (1, 4); 0.2 mm (2, 5); 0.05 mm (3, 6).

Рис. 1-6. *Mediorhynchus* spp. 1-3. *M. papillosus* Van Cleave, 1916, экземпляры от *Motacilla flava*: 1-самец, общий вид; 2-самка, хоботковое влагалище и нервный ганглий; 3-самец, продольные ряды крючков, вид сбоку. 4-6. *M. micracanthus* (Rudolphi, 1819), экземпляры от *Hirundo rustica*: 4-самец, общий вид; 5-самец хоботок; 6-самец, почти продольный ряд крючков, вид сбоку. Масштабная линейка = 1,0 мм (1, 4); 0,2 мм (2, 5); 0,05 мм (3, 6).

garia have more longitudinal rows of spines and longer hooks compared to the previously reported female specimen from *Tringa erythropus* (Pall.) (see Dimitrova & Genov, 1992). In comparison to the other descriptions, the present material exhibits the closest similarity to that by Khokhlova (1966) based on specimens from *Anthus cervinus* (Pall.) from the Lower of the Enisey River and the Norilsk Lakes. The only observed difference is in the length of the roots of the hooks which are larger in my specimens

(0.040–0.050) while Khokhlova (1966) has reported 0.015–0.022. Another description, close to the specimens studied is that by Amin & Dailey (1998); the differences observed concern mainly the number of the longitudinal rows of spines (35–44 in Bulgarian material versus 29–34) and the maximum lengths of hooks (0.0425 versus 0.048) and spines (0.0250 versus 0.0350). Lisitsyna (1994) reported acanthocephalans collected from various hosts and localities in the Ukraine. The differences between her and my material are mainly in the number of spiral rows of spines which are fewer in my specimens (10–12 versus 16–20). There are also differences in the maximum length of the hooks and spines, 0.0425 and 0.0250 in Bulgarian specimens and up to 0.048 and 0.033 in the material of Lisitsyna (1994). The present specimens have longer hook blades (0.030–0.042) and larger eggs (0.067) while in the published data they are, respectively, 0.027–0.030 and 0.047–0.055 (Van Cleave, 1916; Petrochenko, 1958; Schmidt & Kuntz 1977; Peresadko, 1980; Dimitrova & Genov, 1992).

Previously, this species has been reported in Bulgaria from *Tringa erythropus*, *Lullula arborea* (L.), *Hirundo rustica*, *Oenanthe oenanthe* (L.), *Emberiza hortulana* L., *Corvus monedula* (L.) and *Corvus corone* L. (Stoimenov, 1962, 1963; Tsacheva, 1967; Tsacheva-Petrova, 1971; Dimitrova & Genov, 1992). *Ficedula parva* is a new host record for *M. papillosus*.

### *Mediorhynchus micracanthus* (Rudolphi, 1819) Meyer, 1932 (Figs. 4–6)

Material. ♀ from *Acrocephalus arundinaceus* (L.), Chelopechene, May 1983; ♂ from *Corvus corone*, Dolno Ezerovo (Bourgas District), April 1984; ♀ from *Picoides major* (L.), Lozenets (Bourgas District), October 1984; ♀ from *Fringilla coelebs* L., Kiten, October 1984; 2 ♀ from *Perdix perdix* (L.), Sofia District, November 1986; ♂ from *Hirundo rustica*, Krapec, April 1987; ♂ from *Sturnus vulgaris* L., Lovets (Stara Zagora District), April 1990; 2 ♂ from *Corvus frugilegus* L., Sredets (Stara Zagora District), April 1995. *Unpublished specimens*: NHM 1997.7. 3.9 (from *H. rustica*); NHM 1997.7. 3.10–11 (from *P. perdix*); NHM 1997.7. 3.13 (from *P. major*).

Description. Male (based on a specimen from *Hirundo rustica*). Total length of specimen 11.00. Trunk cylindrical, slightly tapering at posterior end, 10.35 long and 1.02 wide (at middle of lemnisci). Main vessels of lacunar system with regular transverse anastomoses. Proboscis 0.488 long. Protoboscis almost conical, slightly oval at tip, 0.311 long and 0.156 wide at tip. Teloboscis 0.177 long and 0.463 wide at base. Proboscis 0.356 wide at constriction. Protoboscis armament of 20 nearly longitudinal rows of hooks, 4 (5) hooks in each row or 8 (9) spiral rows, 8 hooks in each row. Maximum length of hooks (blade×root) 0.030–0.0325×0.040–0.045 (0.035×0.042 in the specimen from *C. corone*). Roots with swellings at base. Teloboscis armament of 32 nearly longitudinal rows of spines, 3 (4) spines in row or 10 (11) spiral rows, 5–6 spines in each row. Maximum length of spines 0.020–0.025. Neck truncate, 0.128 long and 0.575 wide. Proboscis receptacle 0.85 long and 0.219 wide (at level of nerve ganglion). Nerve ganglion 0.156 long, situated at about 0.430 from tip of proboscis. Lemnisci folded, about 3.3–3.6 long and 0.18–0.20 wide, each with 8 giant nuclei. Genital system occupies two thirds of trunk. Testes elongate-oval, situated in tandem without touching one another, occupying second third of trunk. Dimensions of testes 1.50–1.64×0.50–0.57. The cement glands 8 in number, situated in complex. Dimensions of complex 1.65×0.54. Cement ducts 0.84 long. Genital bursa everted but quite deformed.

Female (based on 2 specimens from *Perdix perdix*): Total length 27.10–27.63. Trunk elongate, cylindrical, slightly tapering at posterior end, 26.40–27.00 long and 1.32–1.47 wide. Main vessels of lacunar system with regular transverse anastomoses. Total length of proboscis 0.469–0.500. Protoboscis truncate, 0.340–0.375 long; teloboscis almost cylindrical, 0.125 long and 0.350 wide at base. Proboscis 0.344 wide at constriction. Protoboscis armament of 20 (22) nearly longitudinal rows of hooks, 5 (6) hooks in each row, or 8–9 spiral rows, 8–9 hooks in each row. Maximum length of

hooks (blade×root) 0.030–0.0325×0.045–0.0475. Teloboscis armament of 32–34 nearly longitudinal rows of spines, 4 (5) spines in each row or 10 spiral row, 6 (7) spines in each row. Maximum length of spines 0.0175–0.0225. Neck 0.125–0.218 long. Proboscis receptacle 0.90 long. Lemnisci 4.35–5.4 long. Ripe eggs (observed in one specimen) with dimensions 0.040–0.0475×0.025–0.0275.

Remarks. There are several descriptions of *M. micracanthus* (De Marval, 1905; Kostylev, 1912, 1914, 1916; Meyer, 1933; Florescu, 1941; Petrochenko, 1958; Lisitsyna, 1994) demonstrating its variability. The present specimens are single (with few exceptions) and that prevents from a more detailed examination of the variability. The materials were mainly determined on the basis of the proboscis armament, i. e. 20–24 nearly longitudinal rows of hooks, 4–5 hooks in each row (3–4 hooks, according to the key by Schmidt & Kuntz, 1977) or 8–9 (10) spiral rows, 9–10 hooks in a row on the protoboscis (Meyer, 1933; Petrochenko, 1958; Florescu, 1941). As far as the teloboscis armament is concerned, there are certain differences in the descriptions mentioned: from 10 spiral rows, 4–7 spines per row (Petrochenko, 1958) to 16–20 spiral rows, 3–7 spines per row (Meyer, 1933; Florescu, 1941; Lisitsyna, 1994). According to this character, the present specimens are closest to the description by Petrochenko (1958): 10 spiral rows of 5–6 spines per row compared with 10–12 spiral rows of 5–7 spines in my specimens. Other character employed in the identification is the length of the hook blades: 0.0325–0.035 in my specimens (compared to up to 0.040, according to the key by Schmidt & Kuntz, 1977).

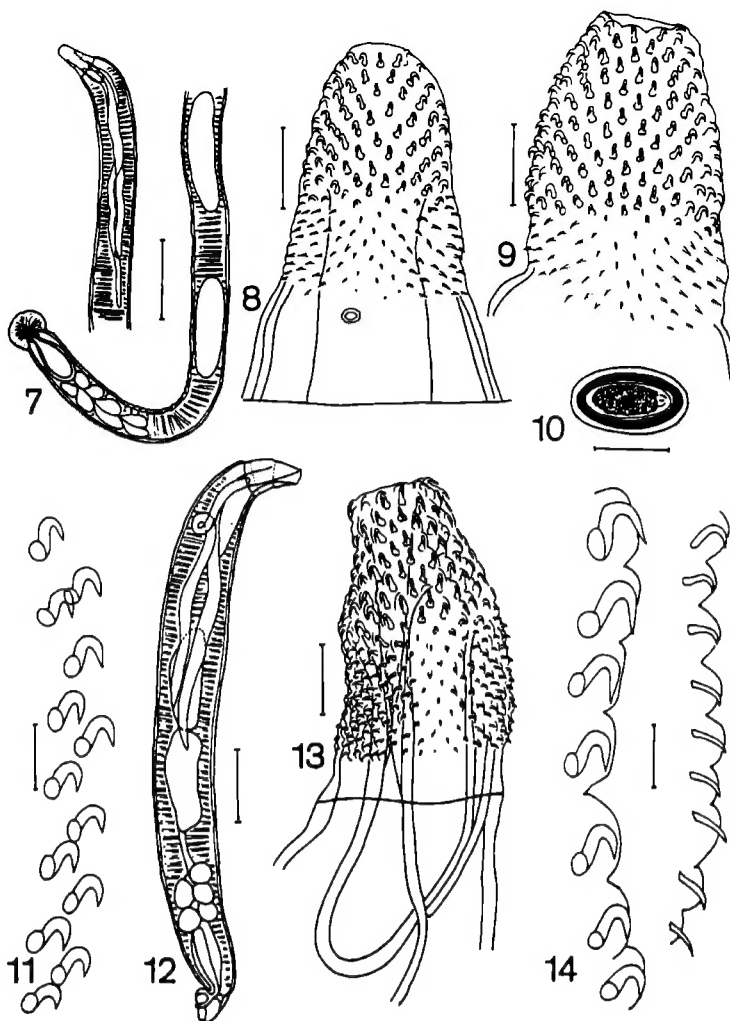
Previously, this species has been reported in Bulgaria from *Falco naumanni* Fleisch., *Picoides major*, *Motacilla cinerea* Tunst., *Motacilla alba* L., *Turdus merula* L., *Acrocephalus schoenabenus* (L.), *Parus major* L., *Sitta europaea* (L.), *Passer domesticus* (L.), *Sturnus vulgaris* and *Corvus corone* (Pavlov, 1940, 1945; Zhelyazkova-Paspaleva, 1962; Tsacheva, 1965a, 1967; Paspalev et al., 1969; Tsacheva-Petrova, 1971; Petrova, 1974). *Perdix perdix*, *Hirundo rustica*, *Acrocephalus arundinaceus* and *Fringilla coelebs* are new host records for *M. micracanthus* in Bulgaria. The record in *Corvus frugilegus* is a new host record for *M. micracanthus*.

### *Mediorhynchus rodensis* Cosin, 1971 (Figs. 7–11)

Material. All the specimens from *Garrulus glandarius* (L.): 4 ♂ and 5 ♀, Lakatnik, October 1983; ♂, Eleshnitsa, November 1988; 9 ♂ and 5 ♀, Pirin Mts (Popovi Livadi), November 1988; ♀, Trankovo (Stara Zagora District), December 1988; ♀, Seltse (Maglzh District), September 1995. Voucherspecimens: NHM 1997.7. 4.1–5 (Lakatnik); NHM 1997.7. 4.6–12 (Pirin Mts).

Description (based on specimens from Pirin Mts, November 1988). Trunk elongate-cylindrical, significantly longer in females. Main vessels of lacunar system with regular transverse anastomoses. Protoboscis truncate, slightly rounded at tip. Teloboscis truncate. Roots of hooks with swellings at base (up to 0.0125 in diameter). Proboscis receptacle approximately cylindrical. Neck with sensory pits. Lemnisci long, slender, slightly unequal.

Male. Total length of specimens 30.0–41.0. Trunk 29.0–40.0 long, with maximum width 1.05–1.35 (at anterior part of lemnisci). Total length of proboscis 0.556–0.682: protoboscis 0.363–0.450 long, teloboscis 0.156–0.250 long and 0.406–0.650 wide at base. Proboscis 0.281–0.394 wide at constriction. Protoboscis armament of 22–24 nearly longitudinal rows of hooks, 6 (5–7) hooks in each row or 10–11 spiral rows, 9–10 (11) hooks in each row. Maximum length of hooks (blade×root) 0.025–0.0275×0.0325–0.040. Teloboscis armament of 32–36 nearly longitudinal rows, 4–5 spines in each row or 10 spiral rows, 5–6 spines in each row. Spines 0.020–0.025 long. Neck 0.220–0.313 long and 0.513–0.700 wide. Proboscis receptacle 1.0–1.17 long. Lemnisci 4.5–6.81 long and 0.18–0.27 wide. Testes elongate-oval, situated slightly after middle of trunk or in its posterior third; distance between testes 0.30–1.88. Dimensions of testes 2.55–3.33×0.63–0.87. Cement glands 8 in number, situated in



Figs. 7–14. *Mediorhynchus* spp. 7–11. *M. rodensis* Cosin, 1971, specimens from *Garrulus glandarius*: 7-male, anterior and posterior part of trunk; 8-male, proboscis; 9-female, proboscis; 10-egg; 11-female, nearly longitudinal rows of hooks, lateral view. 12–14. *M. tenuis* Meyer, 1931, specimens from *Alauda arvensis* and *Perdix perdix*: 12-male, general view; 13-female, proboscis and proboscis receptacle; 14-female, nearly longitudinal row of hooks (left) and spines (right), lateral view. Scale bars = 2.0 mm (7); 1.0 mm (12); 0.2 mm (8, 9, 13); 0.05 mm (10, 11, 14).

Рис. 7–14. *Mediorhynchus* spp. 7–11. *M. rodensis* Cosin, 1971, экземпляры от *Garrulus glandarius*: 7-самец, передняя и задняя части тела; 8-самец, хоботок; 9-самка, хоботок; 10-яйцо; 11-самка, почти продольные ряды крючков, боковой вид. 12–14. *M. tenuis* Meyer, 1931, экземпляры от *Alauda arvensis* и *Perdix perdix*: 12-самец, общий вид; 13-самка, хоботок и хоботковое влагалище; 14-самка, почти продольный ряд крючков (слева) и шипов (справа), вид сбоку. Масштабная линейка = 2,0 мм (7); 1,0 мм (12); 0,2 мм (8, 9, 13); 0,05 мм (10, 11, 14).

testes  $2.55\text{--}3.33 \times 0.63\text{--}0.87$ . Cement glands 8 in number, situated in pairs, in complex with length 1.88–2.55. First pair of cement glands at 1.20–2.20 from end of posterior testis. Cement ducts 1.35–1.80 long. Genital bursa, well everted only in one specimens, semispherical, 0.96 in diameter.

Femle: Total length of specimens 89.64–106.50. Trunk 88.7–106.0 long, 1.20–1.47 wide at anterior end, 1.44–1.56 wide at posterior end. Total length of proboscis

0.625–0.750. Protoboscis 0.425–0.500 long. Teloboscis 0.200–0.250 long and 0.450–0.500 wide. Proboscis 0.381–0.450 wide at constriction. Protoboscis armament of 24–26 nearly longitudinal rows of hooks, 6–7 (8) hooks in each row, or 10–12 spiral rows, 9–11 hooks in each row. Maximum length of hooks (blade×root)  $0.0250\text{--}0.0275$  ( $0.030$ ) $\times$  $0.035\text{--}0.040$ . Teloboscis armament of 32–34 nearly longitudinal rows of spines, 4–5 spines in each row, or 10 spiral rows, 7–8 in each row. Spines 0.020–0.025 long. Neck 0.250–0.300 long and 0.700–0.740 wide. Proboscis receptacle 1.0–1.2 long. Lemnisci 5.85–7.60 long and 0.24–0.27 wide. Uterus with thick walls. Eggs oval, with thick outer shell, without polar prolongations. Maximum dimensions of eggs  $0.0625\text{--}0.080\times 0.040\text{--}0.0475$ .

Remarks. Three species of the genus *Mediorhynchus* have been described from *G. glandarius*: *M. garruli* Yamaguti, 1939 (Japan), *M. lagodekhiensis* Kurashvili, 1955 (Georgia) and *M. rodensis* Cosin, 1971 (Spain). The three species have approximately identical trunk length and proboscis armament (though the proboscis armament of *M. lagodekhiensis* has been presented in spiral rows only and data about the dimensions of its hooks are lacking). Judging by the descriptions, the main differences among these species concern the number of hooks in a longitudinal row, the dimensions of hooks and the measurements of the eggs.

Revising the species of *Mediorhynchus*, Schmidt & Kuntz (1977) considered *M. garruli* as a junior synonym of *M. robustus* Van Cleave, 1916. This taxonomic conclusion does not seem acceptable since the original description and the drawings (Van Cleave, 1916) demonstrate a robust trunk with much smaller size (males 7.0 mm, females 16.0 mm) and extremely small dimensions of probosces. There is no information concerning the number of hooks in a row and, in addition, the eggs are smaller ( $0.038\times 0.016$ ).

As far as the protoboscis armament is concerned, the present specimens correspond to all the three Palaearctic species from *G. glandarius* mentioned. In the males of *M. garruli*, the longitudinal rows of hooks are 22–24, 5 hooks per row (Yamaguti, 1939); in *M. rodensis*, spiral rows of hooks are 11, 8–10 hooks per row (Cosin, 1971) or 20–22 nearly longitudinal rows, 5–7 hooks per row (Schmidt & Kuntz, 1977). In the females studied, the longitudinal rows are 24–26, 6–7 (8) hooks per row, or 10–12 spiral rows, 9–10 hooks per row. The females of *M. lagodekhiensis* were described with 13 spiral rows, 15 hooks per row (Kurashvili, 1957). Judging by the drawing of Kurashvili (1957), there are about 12–13 spiral rows, 12–13 hooks per row. However, in the number of hooks in a longitudinal row, the morphology and dimensions of hooks, the armament of the teloboscis and the dimensions of some internal organs (lemnisci, testes and cement glands), the specimens examined are closest to *M. rodensis*. There are certain differences from *M. rodensis* which concern the trunk width: greater in my specimens (1.20 in the males and 1.56 in the females versus 0.50–0.60 for *M. rodensis*). In addition, the size of eggs is bigger in Bulgarian specimens (up to 0.0775 versus 0.050 for *M. rodensis*). According to these two characters, the specimens studied appear close to *M. garruli* (Yamaguti, 1939). In my opinion, *M. garruli*, *M. lagodekhiensis* and *M. rodensis* are very close forms that need further confirmation on the basis of a re-examination of their types.

In Bulgaria, *M. garruli* has been reported as a parasite of the jay (Tsacheva, 1965 b; Stoimenov et al., 1976). The trunk length of specimens reported by Stoimenov et al. (1976) is greater than that reported for *M. garruli* and *M. rodensis*, especially for the



female specimens (males 50.0–53.0 long, females 130.0–147.0 long). Unfortunately, there are no other morphometric data published about these worms.

***Mediorhynchus tenuis* Meyer, 1931 (Figs. 12–14)**

**Material.** ♂ and ♀ from *Alauda arvensis* L., Balchik, April 1984; 2 ♂ and ♀ from *Melanocorypha calandra* (L.), Krapec, June 1988; ♂ and ♀ from *Glareola pratincola* (L.), Krapec, June 1988; ♂ and ♀ from *Perdix perdix* (L.), Krapec, May 1992. Voucher specimens: NHM 1997.7. 4.13–14 (from *A. arvensis*); NHM 1997.7. 4.15–17 (from *M. calandra*); NHM 1997.7. 4.18–19 (from *G. pratincola*); NHM 1997.7. 4.20–21 (from *P. perdix*).

**Description** (based on 1 male and 1 female from *Alauda arvensis*). Trunk elongate, approximately cylindrical, slightly tapering at posterior end; significantly longer in female specimen. Main vessels of lacunar system with regular transverse anastomoses. Protoboscis truncate. Teloboscis almost cylindrical. Protoboscis armament of 20–22 nearly longitudinal rows of hooks (up to 24 in the specimens from *Melanocorypha calandra* and *Glareola pratincola*), 5–7 hooks in each row, or 10 spiral rows (9–11 in the specimens from the remaining hosts) of 10 (9–11) hooks in each row. Teloboscis armament of 40–44 nearly longitudinal rows, 6–7 (8) spines in each row, or 14–15 spiral rows, 10–11 (9–12) spines in each row. Neck very short, cylindrical, with sensory pits. Nerve ganglion oval, 0.175–0.187 long, at 0.690–0.750 from tip of proboscis. Lemnisci long, slightly unequal, with 8 giant nuclei.

**Male.** Total length 7.94. Trunk 7.20 long and 0.87 wide (at middle). Total length of proboscis 0.625. Protoboscis 0.375 long, 0.170 wide at tip. Teloboscis 0.250 long and 0.425 wide at base. Proboscis 0.313 wide at constriction. Maximum length of hook blades (I–II hooks) 0.040–0.0425. Maximum length of spines 0.0225. Neck 0.113 long and 0.481 wide. Proboscis receptacle 1.0 long. Lemnisci 3.45–3.85 long and 0.18 wide. Testes elongate-oval, situated in tandem, touching one another, occupying second third of trunk. Dimensions of testes 1.40×0.42. Cement glands 8 in number, situated in complex with length 0.90. Cement ducts 0.90 long. Genital bursa everted, with dimensions 0.33×0.45.

**Female.** Total length 25.60. Trunk 24.60 long and 0.87 wide. Proboscis 0.79 long. Protoboscis 0.42 long and 0.20 wide at tip. Teloboscis 0.37 long and 0.48 wide at base. Proboscis 0.42 wide at constriction. Maximum length of hooks (blade×root) 0.0425–0.045×0.045–0.055 (in specimens from other hosts, blades of most anterior two hooks up to 0.0475–0.050). Maximum length of spines 0.025–0.030. Neck 0.15 long and 0.50 wide. Proboscis receptacle 1.05 long and 0.50 wide. Lemnisci 4.9–5.0 long and 0.18–0.19 wide. Ligament sacs filled with egg balls and eggs. Maximum dimensions of eggs 0.055–0.0575×0.035–0.0375. Genital pore terminal.

**Remarks.** The species was originally described from *Saxicola bimaclata* Hempr. & Ehrenb. and *Monticola solitarius* (L.) from Egypt (Meyer, 1931). There were several further descriptions (Ward, 1966; Kamburov, 1966; Lisitsyna, 1994). Some issues arise from the inconsistency in counting the rows of hooks and spines by the various authors. The basic differences between the specimens studied and those described by Meyer (1931) concern the teloboscis armament: the specimens from Bulgaria have 38–46 nearly longitudinal rows of spines, 6–8 spines per row while Meyer (1931) has reported 25–30 spines in "circular direction" and about 10 spines in "longitudinal direction". Ward (1966) described 24 spiral rows of spines with 10 spines in each row on the teloboscis. Judging by her drawing, these data are about the two sides of the teloboscis, i. e., there are about 12 spiral rows on the one side. Therefore, her data are compara-



ble with the specimens from Bulgaria (13–15 spiral rows, 9–11 spines per row). Lisitsyna (1994) reported a greater number of spiral rows of spines (16–18) and a greater number of spines per row (18).

In Bulgaria, Kamburov (1966) reported a single female from *Monticola saxatilis* (L.). I do not find notable differences between the morphology of the female studied by me and that described by Kamburov (1966). He reported 18–20 spines in a horizontal row, i. e. about 36–40 longitudinal rows of spines that is a number close to my data.

The records in *Alauda arvensis*, *Melanocorypha calandra*, *Glareola praticola* and *Perdix perdix* are new host records for *M. tenuis*.

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